CLAIMS [with reference designations]

What is claimed is:

1. A method of generating a high-level vacuum comprising:

evacuating a chamber (102) having a substantially-pure gas (106) therein; and

freezing residual gas (106) in the chamber (102) to generate a high-level vacuum within the chamber (102).

2. The method of claim 1 further comprising:

purging impurities from the chamber (102) with the gas by filling the chamber (102) with the gas, wherein filling comprises at least slightly pressurizing the chamber (102) with the gas; and

repeating the filling and the purging to reduce impurities from the chamber (102) and to obtain a high concentration of the gas within the chamber.

3. The method of claim 2 wherein evacuating comprises evacuating the chamber to a medium-level vacuum,

wherein the method further comprises, after filling the chamber (102) with the gas, evacuating the chamber prior to freezing to generate a medium-level vacuum, and

wherein the medium-level vacuum ranges between approximately $1x10^{-2}$ Torr and $5x10^{-2}$ Torr.

4. The method of claim 3 wherein the substantially-pure gas (106) has in impurity-level of less than approximately 100 parts per million (PPM), and

wherein the gas is carbon-dioxide and has a freezing point of above approximately 100 degrees Kelvin at the medium-level vacuum.

5. The method of claim 4 wherein the chamber (102) comprises a magnet chamber having a magnet (114) therein,

wherein freezing comprises reducing the temperature within the chamber (102) by cooling the magnet (114) to at or below a freezing point of the gas at the medium-level vacuum,

wherein the method further comprising after freezing the gas, further cooling the magnet (114) to a cryogenic temperature, and

wherein the vacuum within the chamber is to provide insulation for the cryogenically-cooled magnet.

6. A vacuum insulation system comprising:

a chamber (102) having a substantially-pure gas (106) therein at less than atmospheric pressure; and

a cooling element (104) to freeze residual gas (106) in the chamber (102) to generate a high-level vacuum within the chamber (102).

7. The system of claim 6 further comprising a medium-level vacuum pump (108) to reduce the pressure within the chamber (102) to a medium-level vacuum before the cooling element (104) operates to freeze the gas,

wherein the medium-level vacuum ranges between approximately $1x10^{-2}$ Torr and $5x10^{-2}$ Torr.

8. The system of claim 7 further comprising:

one or more values (110) operable to allow the gas into the chamber for repeatedly purging the chamber (102) with the gas and operable to repeatedly allow the medium-level vacuum pump (108) to evacuate the chamber to the medium-level vacuum; and

a system controller (118) to operate the one or more valves (110), the vacuum pump (108) and the cooling element (104), to repeatedly purge the chamber (102) with the gas, to evacuate the chamber to the medium-level vacuum, and to cool the chamber.

9. The system of claim 8 further comprising a magnet (114) within the chamber, and wherein the cooling element (104) is to reduce a temperature within the chamber by cooling the magnet (114) to at or below a freezing point of the gas at the medium-level vacuum,

wherein after freezing the gas, the cooling element (104) is to further cool the magnet (114) to a cryogenic temperature, and wherein the high-level vacuum within the chamber (102) is to provide insulation for the cryogenically-cooled magnet.

10. A radar system comprising:

an electromagnet (114); and

a vacuum insulation system (100) to insulate the electromagnet (114), the vacuum insulation system (100) comprising a vacuum chamber (102) having a substantially-pure gas (106) therein at less than atmospheric pressure, a cooling element (104) to freeze the gas (106) for generating a high-level vacuum within the chamber (102),

wherein the electromagnet (114) is to generate a magnetic field for use in controlling a path of an electron beam in an RF power tube of a transmitter of the radar system, and

wherein the electromagnet has windings that become superconducting when cooled by the cooling element (104) and insulated by the high-level vacuum.

VACUUM-INSULATING SYSTEM AND METHOD FOR GENERATING A HIGH-LEVEL VACUUM

Abstract of the Disclosure

[with reference designations]

A method of generating a high-level vacuum comprises evacuating a chamber (102) having a substantially-pure gas (106) therein to a medium-level vacuum, and freezing the residual gas to generate the high-level vacuum within the chamber (102). Impurities, such as atmospheric air, may be purged from the chamber (102) by evacuating the chamber to a medium level vacuum (e.g., around 10^{-2} Torr) and subsequently filling the chamber with the gas (106). This purging process may be repeated multiple times to decrease the level of impurities in the gas filling the chamber (102). The substantially-pure gas may have an impurity-level of less than approximately 100 PPM and may comprise carbon-dioxide, although the scope of the invention is not limited in this respect. The medium level vacuum may range between approximately $1x10^{-2}$ Torr and $5x10^{-2}$ Torr allowing the use of a roughing pump (108), and the high-level vacuum may range between approximately $1x10^{-5}$ and $1x10^{-8}$ Torr.